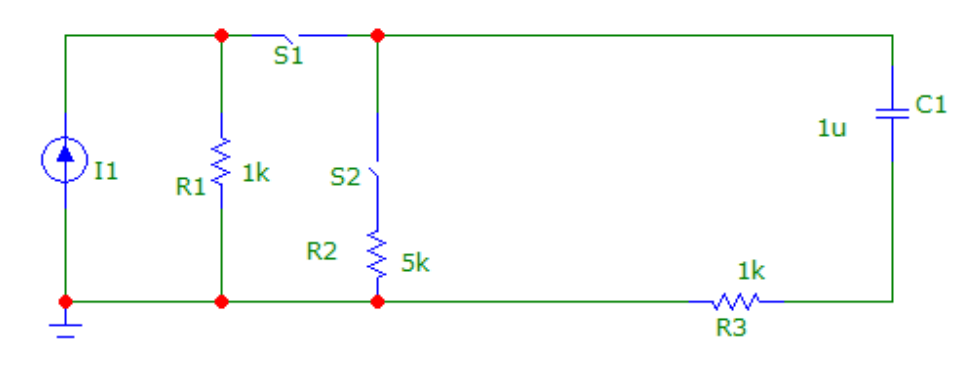


## ESC201T: Introduction to Electronics

### HW -3

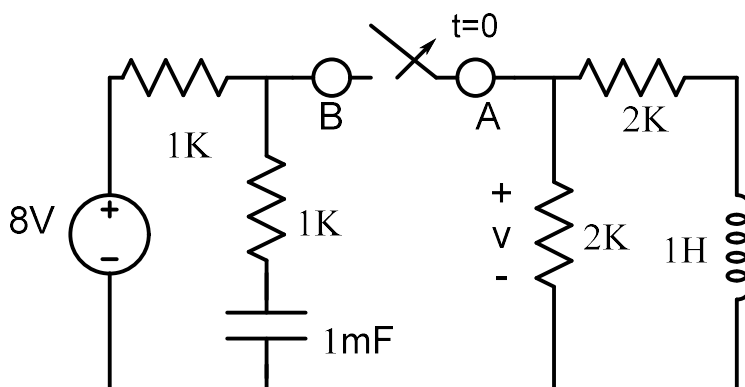
Date: 14.9.2020

Q.1 Find the voltage across the capacitor as a function of time if the switch S2 is opened and S1 is closed at  $t = 0$ . Assume that the current source has a value of 4mA and that before  $t = 0$ , both switches had been in their respective states for a long time so that steady state conditions can be assumed to prevail in the circuit prior to  $t = 0$ .

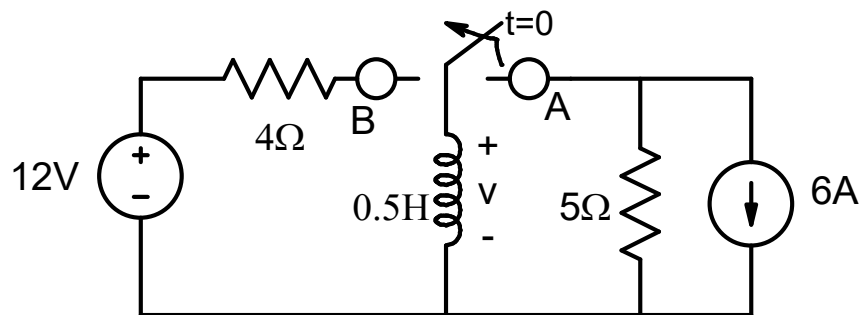


Q.2 Suppose at  $t = 10\text{ms}$ , the switches go back to their original position. Determine the voltage across the capacitor at  $t = 20\text{ms}$

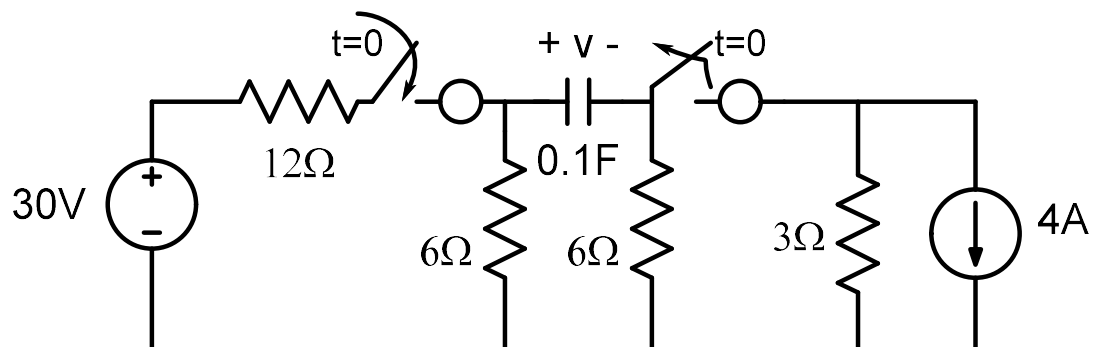
Q.3 For the circuit shown below, determine the voltage  $v$  across the 2K resistor as a function of time after the switch which is closed for a long time is opened at  $t = 0$ .



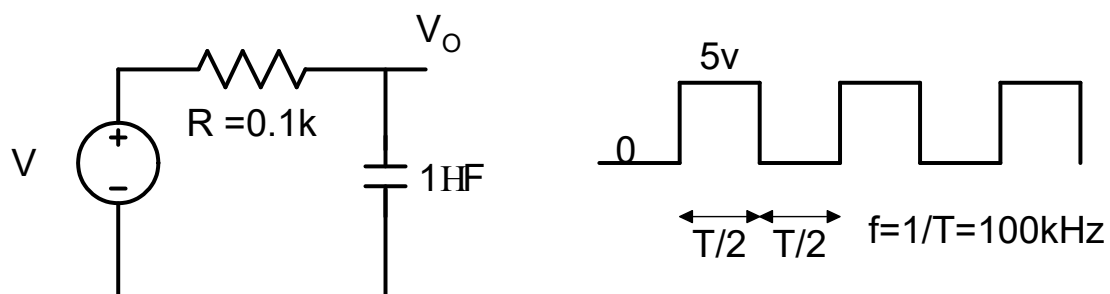
Q.4 Determine the current and voltage across the inductor as a function of time after the switch is connected to node B. The switch was initially connected to A for a long time allowing steady state condition to prevail.



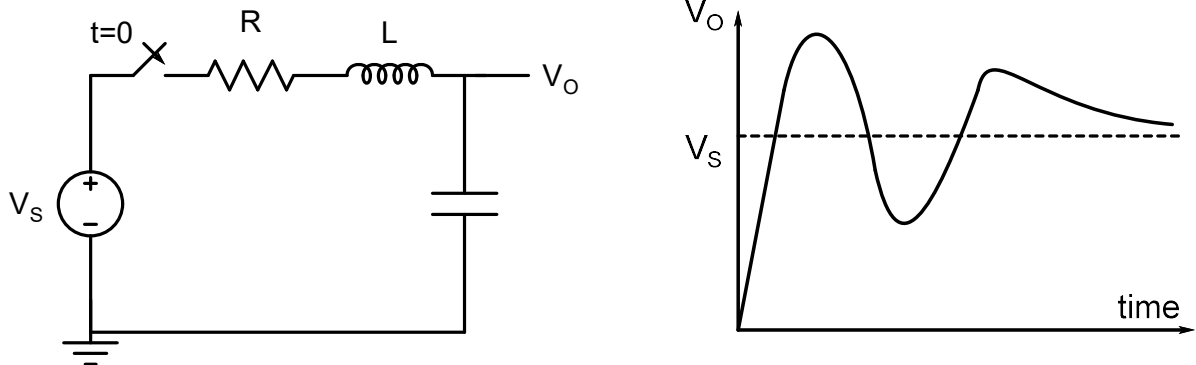
Q.5 Determine the capacitor voltage as a function of time for the circuit shown below assuming that before switches are thrown at  $t=0$  the circuit had enough time to reach steady state.



Q.6 Sketch the output voltage for the circuit shown below if input is of the form shown on the right



**Q.7** In the circuit shown below, the initial values of inductor current and capacitor voltage are zero. At time  $t = 0$ , the switch was closed and the voltage measured across the capacitor is shown on the right. Explain qualitatively (without a full mathematical solution of the circuit) how capacitor voltage can overshoot the supply voltage.



**Q.8** In the circuit shown below, the diode is ideal in the sense that it does not conduct at all in reverse direction and in forward direction, voltage drop across it is zero. Sketch the output voltage across the capacitor for the input voltage  $V_1$  shown on the right.

